National Institute of Environmental Health Sciences

Climate change-related vulnerabilities and local environmental public health tracking through GEMSS: A web-based visualization tool

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Abstract:

Climate change will impact health through a variety of pathways - both direct and indirect. Identifying the specific link between climate-related hazards and vulnerability will require the integration of socio-environmental, meteorological, and health data. An enhanced monitoring and tracking system is critical for public health efforts to identify and reach populations vulnerable to climate-related hazards, mobilize resources, and inform local climate action policy to reduce climate-related health risks. In this paper we present a novel application of a geospatial tool that integrates multiple data sources, allowing for the streamlined visualization of environmental risk, socio-economic and demographic vulnerability, baseline mortality, and policy intervention measures. GEMSS (Geospatial Emergency Management Support System) is a browser-based application that is designed to assemble geospatial information from multiple local or remote sources in a common operating environment, allowing for multi-data visualization. Using vulnerability to extreme heat and heavy rainfall-induced flooding as climate impacts on health, we tested GEMSS's capability as a multi-data platform to visually analyze spatial patterns of climate change environmental public health indicators at the local level. The selected indicators relied on socio-environmental and demographic vulnerability, health, policy, and weather data. The GEMSS system has the potential to support multiple goals including: a) the ongoing monitoring and assessment of climate-related vulnerability through visualization; b) providing policymakers with an open-source tool for understanding how vulnerable populations and the environment could be impacted by proposed climate action policies; c) tracking the ongoing status of climate change policies in reducing socio-environmental vulnerability; d) raising awareness among the general public about the links between climate change and public health; and, e) providing a basis for epidemiologic research (i.e., identifying gaps between climate and human vulnerability leading to hypotheses and hypotheses-testing).

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Resource Description

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Precipitation, Temperature

Extreme Weather Event: Flooding

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

Urban

Geographic Location:

resource focuses on specific location

United States

Health Co-Benefit/Co–Harm (Adaption/Mitigation):

specification of beneficial or harmful impacts to health resulting from efforts to reduce or cope with greenhouse gases

A focus of content

Health Impact:

specification of health effect or disease related to climate change exposure

Injury, Morbidity/Mortality, Other Health Impact

Other Health Impact: heat stress; heat stroke; hyperthermia

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation, Mitigation

Model/Methodology:

type of model used or methodology development is a focus of resource

Computing System, Methodology

Resource Type:

format or standard characteristic of resource

Research Article, Research Article

Resilience:

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content